Linear Shaped Charge Array Draping Study

Windsor Furr
Warhead and Structures Branch, Code 4140
Naval Surface Warfare Center Indian Head Division
101 Strauss Ave.
Indian Head, Maryland 20640-5035
Phone: (301) 744-6742 Fax: (301) 744-6719 E-mail: furrfw@ih.navy.mil

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LONG-TERM GOALS

The long-term goal of this effort is development of the warhead and deployment technology needed for the design of a weapon with the capability to breach obstacles on the beach and in the surf.

OBJECTIVES

The technical objective of this task is development of design tools and data that can be used in obstacle breaching system effectiveness studies. The primary focus of the effort at this time is determination of how an array of linear shaped charges (LSC) drapes over different obstacle types, identification of variables effecting draping, and estimates of lethality of different array geometry concepts.

APPROACH

In general, the approach is to fabricate arrays of inert linear shaped charges, drop these arrays on obstacles and predict how much of the obstacles will be cut. Several array configurations have been investigated in this manner.

WORK COMPLETED

FY99 tests results showed that the rectangular array, Figure 1, performed the best of the three array geometries tested. It was postulated, however, that with some slight modification the hexagonal configuration, Figure 2, could be made to perform better.

Draping tests of the modified hexagonal geometry were completed and a draft report written during the first quarter of FY00.

RESULTS

The hexagonal array geometry was tested against tetrahedrons, simulated log posts, simulated four foot concrete cubes, and hedge hogs. Figure 3 is a post-drop photo of the array draped over the tetrahedrons. Figure 4 is an illustration of the postulated remains of the tetrahedrons after accounting for predicted cutting by the linear shaped charges; the numbers indicate the height of each remaining leg in inches. Figures 5 and 6 are post-drop photos of the array draped over the simulated log posts and

concrete cubes respectively. No penetration predictions have been made for these targets; damage to these targets would best be determined through full-scale explosive testing.

Figure 7 is a post-drop photo of the array draped over the hedgehogs. Figure 8 is an illustration of the postulated remains after accounting for predicted cutting by the linear shaped charges with one exception; the yellow hedge hog should not be defying the laws of physics and should be lying on the ground with a maximum height of approximately 16 inches. The shape of the hedgehogs tends to funnel a significant number of charges into the welded joint area; it is possible that the welds would be broken from the combination of cutting and bulk charge effects. Though it is heavy, the hexagonal array shows more promise than any of the others investigated for defeating the obstacles that may be encountered on the beach or in the surf zone.

IMPACT/APPLICATIONS

The linear shaped charge array may be the only concept that can defeat obstacles both on the beach and in the surf. PMS-407 is expected to perform an Analysis of Alternatives (AOA) in FY 2003. This task will provide important input into that analysis for comparison of the linear shaped charge array to other alternatives.

TRANSITIONS

PMS-407 is expected to perform an AOA in FY 2003. The linear shaped charge array may be a candidate for an Acquisition program.

RELATED PROJECTS

Concrete Obstacle Vulnerability Task- Linear shaped charges of 3200 grain per foot were demonstrated to significantly weaken four foot concrete cubes[1].

REFERENCES

1. J. Renzi, et al, 1998. Concrete Obstacle Vulnerability, Naval Surface Warfare Center, Indian Head Division, IHTR 2126, 30 September.

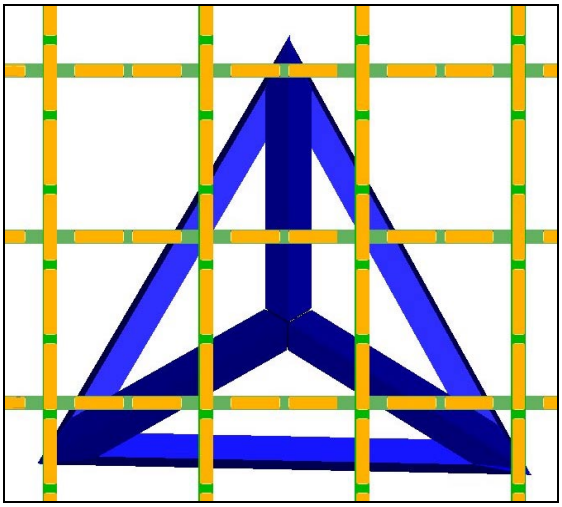

Figure 1

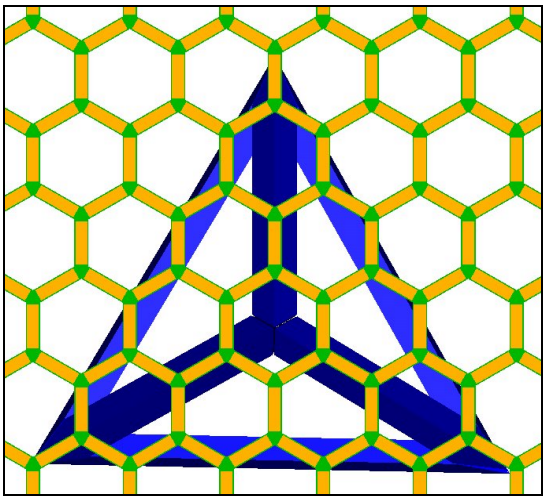

Figure 2

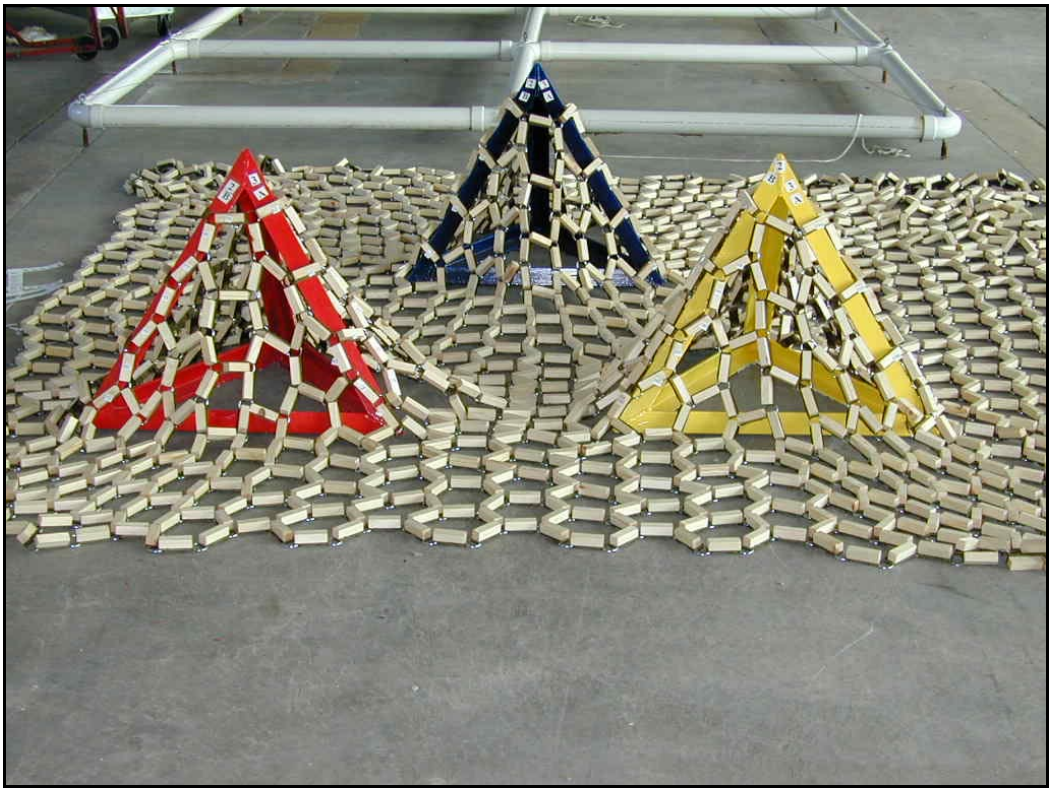

Figure 3

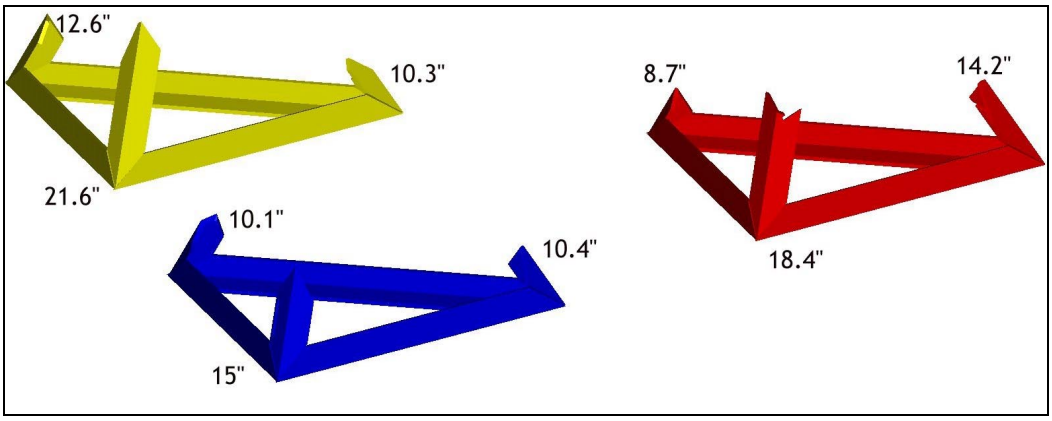

Figure 4

Figure 5

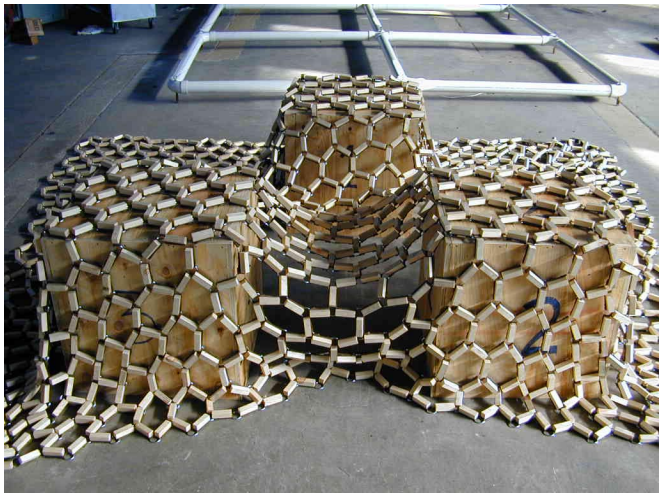

Figure 6

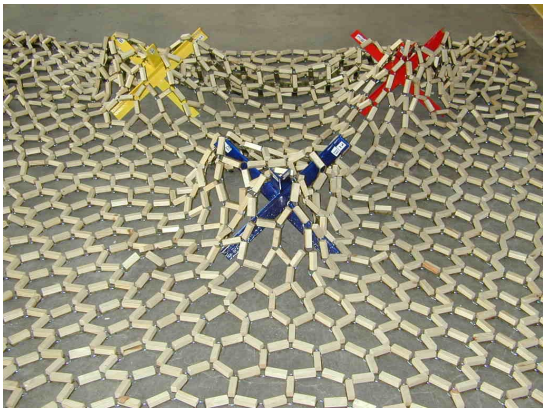

Figure 7

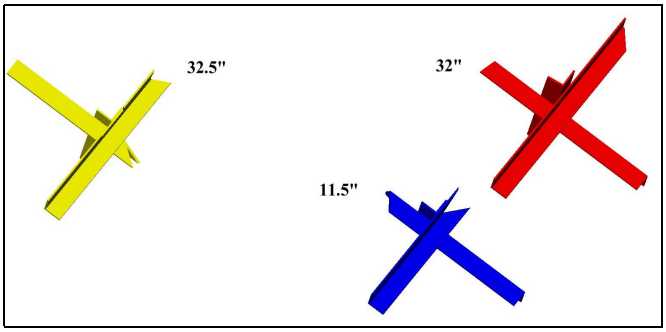

Figure 8